only about half as large as the nuclei in (1) and (2), and the chromatin is compact.

When stained by the Giemsa method, the cytoplasm of (1) and (2) is light blue or gray and that of (3) is light yellow or orange; the nucleus of (1) and (2) is a mottled purple, the reticulated chromatin and lumps of chromatin being clearly differentiated; the nucleus of (3) is a more or less uniform or homogeneous purple. Various stages intermediate between (1) and (2) and (2) and (3) occur.

Types (1) and (2) are considered to be "young red cells" and type (3) "old red cells." These young and old red cells are very easily distinguished from one another after being stained by the Giemsa method.

Several investigators have called attention to the fact that when the mature schizonts in the asexual cycle of certain species of malaria parasites of both man and birds undergo segmentation, the merozoites attack young red cells more readily than they do old red cells. The approximate rate of maturation of young red cells after they are liberated into the peripheral blood of the canary can be determined by observing the comparative age of the red cell and of the growing malaria parasite within it. *Plasmodium cathemerium* was used for our determinations. The merozoites of this species enter young red cells and the schizonts into which they develop grow to maturity in 24 hours; then they segment, giving rise to a new litter of usually from 12 to 20 merozoites. Synchronicity in the segmentation of *P. cathemerium* is pronounced; most of the schizonts segment in the early evening hours. At 10 P.M. most of the recently produced merozoites are present in young red cells. A few hours later the trophozoites have become obviously larger and the red cells have changed from stages (1) or (2) in the direction of stage (3). By the end of 21 hours, that is, at 7 P.M. on the succeeding day, only mature schizonts are present, and these are all in mature red cells. The conclusion reached is that the young parasitized red cells become mature within a period of 21 hours. The percentages of merozoites and mature parasites in young and old red cells obtained from a study of three birds are given in Table 1.

TABLE 1

Bird	Time	Merozoites in young cells	Time (21 hours later)	Mature trophozoites in old cells
1	10 P.M.	88.4 per cent.	7 P.M.	100 per cent.
2	"	75.3 " "	"	100 " "
3	"	84.6 " "	"	100 " "

The rate of maturation of these young red cells may have been accelerated or retarded because of the presence of the malaria parasites, hence the following *in vitro* experiments were carried out. Blood was drawn from canaries and kept at room temperature. Counts of young and old red cells were made at the time the blood was drawn and again at the end of 24 hours. The percentages of young cells present are given in Table 2.

TABLE 2

Bird	Young red cells in fresh blood	Young red cells after 24 hours
1	6 per cent.	0.4 per cent.
2	12.3 " "	0.2 " "
3	33.4 " "	0.2 " "

Birds 2 and 3 had been treated with phenylhydrazine in order to bring about an increase in the number of young red cells.

These *in vitro* experiments indicate that in drawn blood at room temperature practically all the young cells became mature within 24 hours. Thus the period required for the maturation of the young red cells in the peripheral blood of canaries appears to be less than 24 hours both in parasitized and in non-parasitized cells.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

EMBRYONIC SERIES IN SNAKES

DATA on Ophidian embryology are incomplete largely because of the difficulties involved in acquiring a satisfactory series of stages. Sacrifice of a gravid female yields an abundance of material of one stage, but to obtain a continuous record of development by this method would be almost impossible for rare or secretive snakes and both laborious and wasteful for common snakes.

To obviate this waste, Professor Peter Okkelberg, of the department of zoology of the University of Michigan, suggested that successive stages in development might presumably be obtained by a series of "Caesarean" operations on a single female. Such operations were begun in the summer of 1935 and proved highly successful.

Nembutal (sodium pentabarbital) is employed as the anesthetic. The strength most generally applicable is 0.5 per cent. in physiological saline solution. About two to three cc of this solution are injected intraperitoneally approximately at the middle of the body. Exact dosage is not important. Small snakes, such as *Diadophis* and *Tropidoclonion*, require proportionately less of the anesthetic (0.1 cc per 10 grams of

body weight) than larger snakes, such as *Natrix cyclopion floridana* Goff (1.0 cc per 30 grams of body weight). The former are fully anesthetized in from five to ten minutes and recover in six to twelve hours; the latter require one to two hours for complete anesthesia and recover in twenty-four to forty-eight hours. In approximately one hundred operations on snakes of a variety of Colubrid genera, both oviparous and ovoviviparous, no fatality has resulted from the anesthetic.

This rather striking and successful use of nembutal with cold-blooded vertebrates deserves special note. Although this anesthetic has been extensively used during the past several years both on humans and lower mammals, there is, to my knowledge, no record of its application to vertebrates below the mammals. The ill effects which sometimes accompany the use of respiratory anesthetics, such as ether and chloroform, were not apparent in snakes treated with nembutal. This observation should be of interest to workers in fields other than embryology.

The operation consists of the exposure of the oviduct by a short longitudinal abdominal slit slightly lateral to the mid-line and near the position of the most cranial embryo. The oviduct is then opened, and one or more embryos removed, the rest being left to continue development. It is not necessary to suture the oviduct and peritoneum, but the abdominal incision is closed by appressing the fleshy surfaces and securing them by a stitch of white linen thread at the base of each scute. On some ovoviviparous forms the process was repeated at intervals of three days; however, there is no reason to believe that a shorter interval would not be feasible. At each new operation, slits were made in progression posteriorly until all the embryos had been removed. I have had no opportunity to observe the effect of repeated operation on oviparous forms.

Removal of some embryos interferes in no way with the development of those remaining. Only one snake, *Thamnophis sirtalis sirtalis* (L.), was allowed to give birth to young after operation; from this specimen fourteen embryos had been removed in five weekly operations. The remaining two young were delivered at the expected time and were normal in every respect. During the summer of 1936 it was further observed that the rate of development was precisely the same in both operated and unoperated snakes which had been kept under the same laboratory conditions.

By this method it has been possible to secure embryonic material in series; it seems that this could have been accomplished in no other practical way.

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PHOTOGRAPHY IN THE BIOLOGY CLASSROOM

NOTE-TAKING by means of the newer types of small cameras is a classroom technique being employed successfully by several students in my biology classes. Photomicrographs of the various slides being used in laboratory can easily be taken by using a photomicrographic collar attachment set at infinity, with an exposure of from 3 to 10 seconds on Super-Pan film. The microscope may be focused in the usual way, using light from an ordinary table microscope lamp. These photographs, when mounted and supplemented with descriptive sketches and labels, make a most attractive and useful notebook record of laboratory work. One student, using an f.2 shutter and 1 second exposure on Super-X film, has regularly been photographing lantern slides as they are thrown on the screen during lectures and then using them to advantage as addenda to his written lecture notes. Several men on our teaching staff have also found that photographs of laboratory dissections and photomicrographs of slides and tissue preparations when properly enlarged, labeled and covered with Cellophane, may be successfully used as demonstrations for short practical laboratory quizzes on occasions when circumstances do not permit the preparation of actual specimens for large numbers of students.

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